



CLEAN ENERGY REWARDS

CLEAN ENERGY REWARDS PROGRAM
DEPARTMENT OF ENVIRONMENTAL PROTECTION
MONTGOMERY COUNTY, MARYLAND

Solar

"...there's an enormous fusion reactor safely banked a few million miles from us. It delivers more energy than we could ever use in just about 8 minutes. And it's wireless!"

-- William McDonough, 2006

How does the sun provide energy?

The sun itself is energy! The sun is a star that is constantly emitting light, which is energy. The energy that gets through the earth's atmosphere helps plants grow, tans our skin, and can be harnessed by solar cells and converted to electricity. Did you know that the amount of energy that reaches the ground in an hour is greater than the amount of energy used by the world's population in a year?

There are parts of the earth that get more solar energy than others. This is due to the earth's rotation around the sun - what gives us the seasons. Generally, parts of the world with two seasons, or land near the equator, tend to get the most solar radiation, and are some of the best places to develop large scale solar energy systems. However, small scale systems that you may notice on local homes and buildings can generate a fair amount of electricity to serve on-site electricity demands.

How is solar energy turned into electricity?

Photovoltaic cells, or PV cells, are used to capture the sun's energy and convert it into electricity. This process is call the photoelectric effect. Each PV cell is capable of making the same amount of electricity. The amount of

electricity a system can produce can be estimated when several cells are put together on a panel.

What is a PV cell?

A PV cell is made of two layers of material; most common today is crystalline silicon. One layer is positively charged, the other negatively. An electric field is created by sandwiching these two layers together. The sun's radiation hits the PV cell and reacts with the crystalline silicon, generating energy. This energy is captured and converted to electricity.

Silicon is a popular material for this process because the atoms of a molecule of silicon have electrons than can be "traded" or "set free" when acted upon by outside energies. When the sun's energy interacts with silicon, some of the silicon's electrons are released. The free silicon electrons get caught in the electric field created between the positive and negative layers of silicon material, and an electric charge is made.

This energy is captured by fine metal wires that form a grid on top of the cells. You can usually see this grid if you look at a PV panel very closely. The energy travels through the wires to an inverter which turns all of the energy into usable electricity. Some PV systems include batteries to store the electricity for future use. If the system does not have storage batteries and there is no immediate demand for the electricity, it can be sold back to the energy supplier in a process called net-metering.

Why is solar energy so great?

Solar technology and the solar industry have grown quickly over the past 35 years. PV arrays are becoming more efficient at generating



electricity and are more cost effective. The solar industry is creating new jobs -- about 3,000 jobs for every \$100 million of PV module sales. At the current growth rate this industry could employ over 150,000 Americans in high-tech jobs within 20 years!

PV systems generate electricity without releasing any bi-products -- no gas emissions or particulate pollutants. Solar panels do not make any noise and they utilize the sun's energy (a readily available resource). What about a cloudy day? Not to worry - solar panels can still produce up to 80% of their potential energy on a partly cloudy day, and up to 25% of their potential on an overcast day.

PV panels are easy to maintain. Any battery packs attached to the system have to be checked from time to time, but other than that, solar panels are tested for their durability against impacts and extreme weather conditions. If the system does not have a battery pack attached to it to store electricity, then any unused electricity can be net-metered, or sent back to the grid.

What is net-metering and how does it work?

Net-metering is a way to account for electricity generated by a PV system that was not used. Let's say you have a PV system that does not have battery storage attached to it. The system will generate electricity all day, but the home or building may not be able to use all of that electricity right away. Any electricity that cannot be used immediately can be sold back to the energy supplier.

When electricity generated from a solar panel is sold back, the meter on the home or building will actually start to turn backwards crediting the owner for electricity already used that month. If the PV system produced more electricity than the home or building used, then the owner will get a credit from the energy supplier for the electricity sold back to the grid at the end of the month. If the PV system produced less than the amount of electricity used, then the owner will pay for the electricity provided by the energy supplier.

Sources include:
U.S. Department of Energy
National Renewable Energy Laboratory
Center for Renewable Energy and Sustainable Technology

How much electricity could I generate at my home?

That depends on several factors such as your home's access to unobstructed sunlight, the amount of space you have to install a PV system, and how much you are willing to invest. The Maryland Energy Administration estimates that a 1 kilowatt (KW) PV array located near Baltimore will produce about 1000 - 1250 kilowatt-hour (kWh) per year. Look at the energy usage on your electric bill to see how many months this amount of energy will offset. A system this size may cost up to \$12,000.

Are there any financial incentives to install a PV system?

Yes! The Maryland Energy Administration supports a Solar Grant program. Residents can receive up to \$3000, and commercial buildings can receive up to \$5000 in assistance to install a PV system. Go to:

<http://www.energy.state.md.us/programs/renewable> and click on the link for the Solar Grant Program.

There are also federal tax credits (up to 30% of the cost of the system) for consumers installing qualified PV panels. Check the IRS web site for more information:

<http://www.irs.gov> You can also earn rewards through the Clean Energy Rewards program once your system is installed and generating electricity. Visit our web site to learn more.

I'm interested. Where do I start?

The best thing to do is contact a solar installer in your area for system recommendations and an estimate. A list of contractors and other tools to help you estimate a PV system's cost and payback is available at:

<http://www.findsolar.com>

The Maryland Energy Administration's *Mid-Atlantic Region Consumer's Guide to Buying a Solar Electric System* provides detailed information about installing a solar PV system, including a list of financial resources to get your project off the ground. This document can be found on the Solar Grant Program's web site listed above.



Clean Energy Rewards Program / www.montgomerycountymd.gov/cleanenergyrewards

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